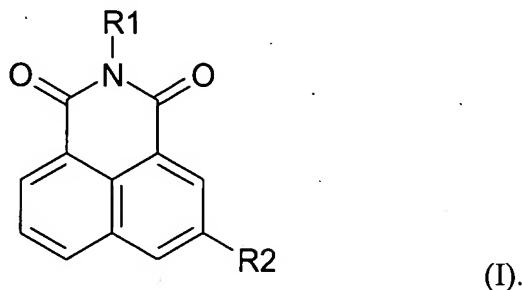


## CLAIMS

What is claimed is:

1. A compound represented by the following structural formula:



5

wherein:

R1 is  $-(CH_2)_nN^+HR3R4 X^-$  or R1 is  $-(CH_2)_nN^+HR3R4 X^-$  or  
 $-(CH_2)_nNR3R4$  when R2 is  $-N^+HR6R7$ ;

R2 is  $-OR5$ , halogen,  $-NR6R7$ ,  $-N^+HR6R7 X^-$  sulphonic acid, nitro,  
 $-NR5COOR5$ ,  $-NR5COR5$  or  $-OCOR5$ ;

10

R3 and R4 are independently H, C1-C4 alkyl group or, taken together  
with the nitrogen atom to which they are bonded, a non-aromatic nitrogen-  
containing heterocyclic group;

each R5 is independently  $-H$  or a C1-C4 alkyl group;

15

R6 and R7 are independently H, C1-C4 alkyl group or, taken together  
with the nitrogen atom to which they are bonded, a non-aromatic nitrogen-  
containing heterocyclic group;

n is an integer from 0-3; and

$X^-$  is the carboxylate anion of an organic carboxylic acid compound.

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2. The compound of Claim 1 wherein:

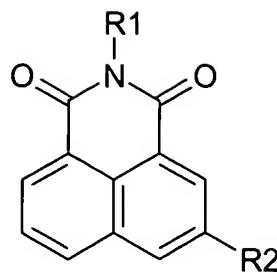
n is 2;

R2 is  $-NO_2$ ,  $-NH_2$  or  $-NH_3^+X^-$ ; and

R3 and R4 are the same and are  $-H$ ,  $-CH_3$  or  $-CH_2CH_3$ .

3. The compound of Claim 2 wherein R3 and R4 are -CH<sub>3</sub>.
4. The compound of Claim 1 wherein X<sup>-</sup> is the carboxylate anion of a C1-C4 aliphatic monocarboxylic acid, hydroxy C2-C6 aliphatic monocarboxylic acid, keto C2-C6 aliphatic monocarboxylic acid, amino C2-C6 aliphatic monocarboxylic acid, C2-C8 aliphatic dicarboxylic acid, hydroxy C3-C8 aliphatic dicarboxylic acid, keto C3-C8 aliphatic dicarboxylic acid, amino C3-C8 aliphatic dicarboxylic acid, C3-C8 aliphatic tricarboxylic acid, hydroxy C4-C10 tricarboxylic acid, keto C4-C10 tricarboxylic acid, amino C4-C10 tricarboxylic acid, an aryl carboxylic acid, C1-C5 heteroalkyl monocarboxylic acid or C3-C8 heteroalkyl dicarboxylic acid.
5. The compound of Claim 1 wherein X<sup>-</sup> is the carboxylate anion of a hydroxy C2-C6 aliphatic monocarboxylic acid, a keto C2-C6 aliphatic monocarboxylic acid, a C2-C8 aliphatic dicarboxylic acid, a hydroxy C3-C8 aliphatic dicarboxylic acid, a keto C3-C8 aliphatic dicarboxylic acid, a C3-C8 tricarboxylic acid, a hydroxy C4-C8 tricarboxylic acid, or a keto C4-C8 tricarboxylic acid and the compound is amonafide.
- 20 6. The compound of Claim 3 wherein X<sup>-</sup> is the carboxylate anion of a C1-C4 aliphatic monocarboxylic acid, hydroxy C2-C6 aliphatic monocarboxylic acid, keto C2-C6 aliphatic monocarboxylic acid, amino C2-C6 aliphatic monocarboxylic acid, C2-C8 aliphatic dicarboxylic acid, hydroxy C3-C8 aliphatic dicarboxylic acid, keto C3-C8 aliphatic dicarboxylic acid, amino C3-C8 aliphatic dicarboxylic acid, C3-C8 aliphatic tricarboxylic acid, hydroxy C4-C10 tricarboxylic acid, keto C4-C10 tricarboxylic acid, amino C4-C10 tricarboxylic acid, an aryl carboxylic acid, C1-C5 heteroalkyl monocarboxylic acid or C3-C8 heteroalkyl dicarboxylic acid.

7. The compound of Claim 1 wherein X<sup>-</sup> is the carboxylate anion of formic acid, acetic acid, propionic acid, 2-pentenoic acid, 3-pentenoic acid, 3-methyl-2-butenoic acid, 4-methyl-3-pentenoic acid lactic acid, glycolic, mandelic acid, oxaloacetic acid, alpha-ketoglutaric acid, pyruvic acid, aspartic acid, glutamic acid, malonic acid, succinic acid, adipic acid, maleic acid, fumaric acid, malic acid, tartaric acid, citric acid or gluconic acid.
8. The compound of Claim 3 wherein X<sup>-</sup> is the carboxylate anion of formic acid, acetic acid, propionic acid, 2-pentenoic acid, 3-pentenoic acid, 3-methyl-2-butenoic acid, 4-methyl-3-pentenoic acid, lactic acid, glycolic, mandelic acid, oxaloacetic acid, alpha-ketoglutaric acid, pyruvic acid, aspartic acid, glutamic acid, malonic acid, succinic acid, adipic acid, maleic acid, fumaric acid, malic acid, tartaric acid, citric acid or gluconic acid.
- 15 9. The compound of Claim 1 wherein the compound is amonafide tartrate, amonafide adipate, amonafide aspartate, amonafide citrate, amonafide fumarate, amonafide glycolate, amonafide maleate, amonafide malonate, amonafide 2-oxoglutarate, amonafide pyruvate, amonafide salicylate, amonafide hemisuccinate or amonafide succinate.
- 20 10. The compound of Claim 1 wherein X<sup>-</sup> is malate or glycolate.
11. The compound of Claim 1 wherein the compound is monovalent.
- 25 12. A pharmaceutical composition comprising a pharmaceutically acceptable carrier or diluent and a compound represented by the following structural formula:



wherein:

R1 is  $-(CH_2)_nN^+HR3R4 X^-$  or R1 is  $-(CH_2)_nN^+HR3R4 X^-$  or  
 $-(CH_2)_nNR3R4$  when R2 is  $-N^+HR6R7$ ;

5            R2 is  $-OR5$ , halogen,  $-NR6R7$ ,  $-N^+HR6R7 X^-$  sulphonic acid, nitro,  
 $-NR5COOR5$ ,  $-NR5COR5$  or  $-OCOR5$ ;

10          R3 and R4 are independently H, C1-C4 alkyl group or, taken together  
with the nitrogen atom to which they are bonded, a non-aromatic nitrogen-  
containing heterocyclic group;

each R5 is independently  $-H$  or a C1-C4 alkyl group;

15          R6 and R7 are independently H, C1-C4 alkyl group or, taken together  
with the nitrogen atom to which they are bonded, a non-aromatic nitrogen-  
containing heterocyclic group;

n is an integer from 0-3; and

15          X $^-$  is the carboxylate anion of an organic carboxylic acid compound.

13. The pharmaceutical composition of Claim 12 wherein:

n is 2;

20          R2 is  $-NO_2$ ,  $-NH_2$  or  $-NH_3^+X^-$ ; and

R3 and R4 are the same and are  $-H$ ,  $-CH_3$  or  $-CH_2CH_3$ .

14. The pharmaceutical composition of Claim 13 wherein R3 and R4 are  $-CH_3$ .

15. The pharmaceutical composition of Claim 12 wherein X $^-$  is the carboxylate  
25          anion of a C1-C4 aliphatic monocarboxylic acid, hydroxy C2-C6 aliphatic

monocarboxylic acid, keto C2-C6 aliphatic monocarboxylic acid, amino C2-C6 aliphatic monocarboxylic acid, C2-C8 aliphatic dicarboxylic acid, hydroxy C3-C8 aliphatic dicarboxylic acid, keto C3-C8 aliphatic dicarboxylic acid, amino C3-C8 aliphatic dicarboxylic acid, C3-C8 aliphatic tricarboxylic acid, hydroxy C4-C10 tricarboxylic acid, keto C4-C10 tricarboxylic acid, amino C4-C10 tricarboxylic acid, an aryl carboxylic acid, C1-C5 heteroalkyl monocarboxylic acid or C3-C8 heteroalkyl dicarboxylic acid.

16. The pharmaceutical composition of Claim 14 wherein X<sup>-</sup> is the carboxylate anion of a C1-C4 aliphatic monocarboxylic acid, hydroxy C2-C6 aliphatic monocarboxylic acid, keto C2-C6 aliphatic monocarboxylic acid, amino C2-C6 aliphatic monocarboxylic acid, C2-C8 aliphatic dicarboxylic acid, hydroxy C3-C8 aliphatic dicarboxylic acid, keto C3-C8 aliphatic dicarboxylic acid, amino C3-C8 aliphatic dicarboxylic acid, C3-C8 aliphatic tricarboxylic acid, hydroxy C4-C10 tricarboxylic acid, keto C4-C10 tricarboxylic acid, amino C4-C10 tricarboxylic acid, an aryl carboxylic acid, C1-C5 heteroalkyl monocarboxylic acid or C3-C8 heteroalkyl dicarboxylic acid.

17. The pharmaceutical composition of Claim 12 wherein X<sup>-</sup> is the carboxylate anion of formic acid, acetic acid, propionic acid, 2-pentenoic acid, 3-pentenoic acid, 3-methyl-2-butenoic acid, 4-methyl-3-pentenoic acid lactic acid, glycolic, mandelic acid, oxaloacetic acid, alpha-ketoglutaric acid, pyruvic acid, aspartic acid, glutamic acid, malonic acid, succinic acid, adipic acid, maleic acid, fumaric acid, malic acid, tartaric acid, citric acid or gluconic acid.

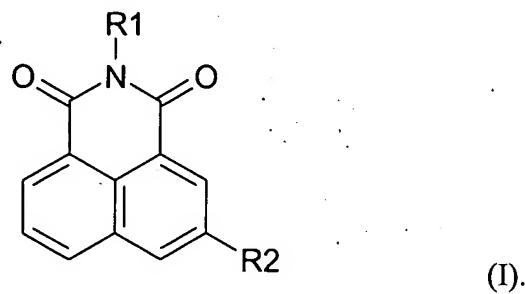
18. The pharmaceutical composition of Claim 14 wherein X<sup>-</sup> is the carboxylate anion of formic acid, acetic acid, propionic acid, 2-pentenoic acid, 3-pentenoic acid, 3-methyl-2-butenoic acid, 4-methyl-3-pentenoic acid, lactic acid, glycolic, mandelic acid, oxaloacetic acid, alpha-ketoglutaric acid, pyruvic acid, aspartic

acid, glutamic acid, malonic acid, succinic acid, adipic acid, maleic acid, fumaric acid, malic acid, tartaric acid, citric acid or gluconic acid.

19. The pharmaceutical composition of Claim 12 wherein X<sup>-</sup> is malate or glycolate.

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20. A method of treating a subject with cancer comprising the step of administering to the subject an effective amount of a compound represented by the following structural formula:



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wherein:

R1 is -(CH<sub>2</sub>)<sub>n</sub>N<sup>+</sup>HR3R4 X<sup>-</sup> or R1 is -(CH<sub>2</sub>)<sub>n</sub>N<sup>+</sup>HR3R4 X<sup>-</sup> or -(CH<sub>2</sub>)<sub>n</sub>NR3R4 when R2 is -N<sup>+</sup>HR6R7;

R2 is -OR5, halogen, -NR6R7, -N<sup>+</sup>HR6R7 X<sup>-</sup>, sulphonic acid, nitro, -NR5COOR5, -NR5COR5 or -OCOR5;

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R3 and R4 are independently H, C1-C4 alkyl group or, taken together with the nitrogen atom to which they are bonded, a non-aromatic nitrogen-containing heterocyclic group;

each R5 is independently -H or a C1-C4 alkyl group;

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R6 and R7 are independently H, C1-C4 alkyl group or, taken together with the nitrogen atom to which they are bonded, a non-aromatic nitrogen-containing heterocyclic group;

n is an integer from 0-3; and

X<sup>-</sup> is the carboxylate anion of an organic carboxylic acid compound.

25 21. The method of Claim 20 wherein:

n is 2;

R2 is  $-NO_2$ ,  $-NH_2$  or  $-NH_3^+X^-$ ; and

R3 and R4 are the same and are  $-H$ ,  $-CH_3$  or  $-CH_2CH_3$ .

5    22. The method of Claim 21 wherein R3 and R4 are  $-CH_3$ .

23. The method of Claim 20 wherein  $X^-$  is the carboxylate anion of a C1-C4 aliphatic monocarboxylic acid, hydroxy C2-C6 aliphatic monocarboxylic acid, keto C2-C6 aliphatic monocarboxylic acid, amino C2-C6 aliphatic 10 monocarboxylic acid, C2-C8 aliphatic dicarboxylic acid, hydroxy C3-C8 aliphatic dicarboxylic acid, keto C3-C8 aliphatic dicarboxylic acid, amino C3-C8 aliphatic dicarboxylic acid, C3-C8 aliphatic tricarboxylic acid, hydroxy C4-C10 tricarboxylic acid, keto C4-C10 tricarboxylic acid, amino C4-C10 15 tricarboxylic acid, an aryl carboxylic acid, C1-C5 heteroalkyl monocarboxylic acid or C3-C8 heteroalkyl dicarboxylic acid.

24. The method of Claim 22 wherein  $X^-$  is the carboxylate anion of a C1-C4 aliphatic monocarboxylic acid, hydroxy C2-C6 aliphatic monocarboxylic acid, keto C2-C6 aliphatic monocarboxylic acid, amino C2-C6 aliphatic 20 monocarboxylic acid, C2-C8 aliphatic dicarboxylic acid, hydroxy C3-C8 aliphatic dicarboxylic acid, keto C3-C8 aliphatic dicarboxylic acid, amino C3-C8 aliphatic dicarboxylic acid, C3-C8 aliphatic tricarboxylic acid, hydroxy C4-C10 tricarboxylic acid, keto C4-C10 tricarboxylic acid, amino C4-C10 25 tricarboxylic acid, an aryl carboxylic acid, C1-C5 heteroalkyl monocarboxylic acid or C3-C8 heteroalkyl dicarboxylic acid.

25. The method of Claim 20 wherein  $X^-$  is the carboxylate anion of formic acid, acetic acid, propionic acid, 2-pentenoic acid, 3-pentenoic acid, 3-methyl-2-butenoic acid, 4-methyl-3-pentenoic acid lactic acid, glycolic, mandelic acid, oxaloacetic acid, alpha-ketoglutaric acid, pyruvic acid, aspartic acid, glutamic acid, 30

malonic acid, succinic acid, adipic acid, maleic acid, fumaric acid, malic acid, tartaric acid, citric acid or gluconic acid.

26. The method of Claim 22 wherein X<sup>-</sup> is the carboxylate anion of formic acid, acetic acid, propionic acid, 2-pentenoic acid, 3-pentenoic acid, 3-methyl-2-butenoic acid, 4-methyl-3-pentenoic acid, lactic acid, glycolic, mandelic acid, oxaloacetic acid, alpha-ketoglutaric acid, pyruvic acid, aspartic acid, glutamic acid, malonic acid, succinic acid, adipic acid, maleic acid, fumaric acid, malic acid, tartaric acid, citric acid or gluconic acid.
- 10 27. The method of Claim 20 wherein X<sup>-</sup> is malate or glycolate.
- 15 28. The method of Claim 20 wherein cancer is selected from the group consisting of breast cancer, colon cancer, lung cancer, prostate cancer, renal cancer, glioma and leukemia.
29. The method of Claim 20 wherein cancer is selected from the group consisting of breast cancer, colon cancer, lung cancer, renal cancer and prostate cancer.